OIL POSSIBILITIES OF THE LETHBRIDGE-KEHO LAKE FOLD

by

EDWARD REX LOVEWELL

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On the Occurance of Oil Pools

Throughout the world, oil is produced from pools, formed by the action of nature in the porous rocks of domes and anticlines. Petroleum was first called rock oil.

Oil pools vary in extent and productivity depending on:- 1. The extent of the drainage areas from which the oil has migrated. 2. The size of the structure. 3. The thickness and porosity of the rock strata from which the oil is derived and in which it accumulated. 4. The rock pressures under which it is held.

No such things as lakes of oil or rivers of oil exist under ground. Porous sands or cavernous limestones form the best reservoirs, yielding the largest flows of oil and the highest percentages of recovery. By far the greatest number of oil fields have been "sand" fields. The oil exists, usually under high pressures, in the interstices between the grains of sand. An ordinary coarse sand rock has an oil capacity of from 25% to 30% of its volume.

Oil could not collect in pools in the porous strata of the earth were it not for the subterranean waters (usually salt water) which act as a collection agency, and on which the molecules of oil are floated out of the synclines into the anticlines. Thus all oil fields have what is termed "edge water" found in the wells at the limitis of the pool.

A simple dome or anticlinal structure is the elevated portion of the contorted and folded strata of the earth. Gas, oil and water arrange themselves in the oil bearing sand according to their relative specific gravity;--oil being lighter than water, gas lighter than oil. (see Plate 1)

On the next page is an Ideal cross-section of an oil pool. It will readily be understood of course, that the regularity depicted here is not often found in nature. Every oil field is just a little different from the others. The variations in the folding, extent, stratigraphy etc. are unlimited.

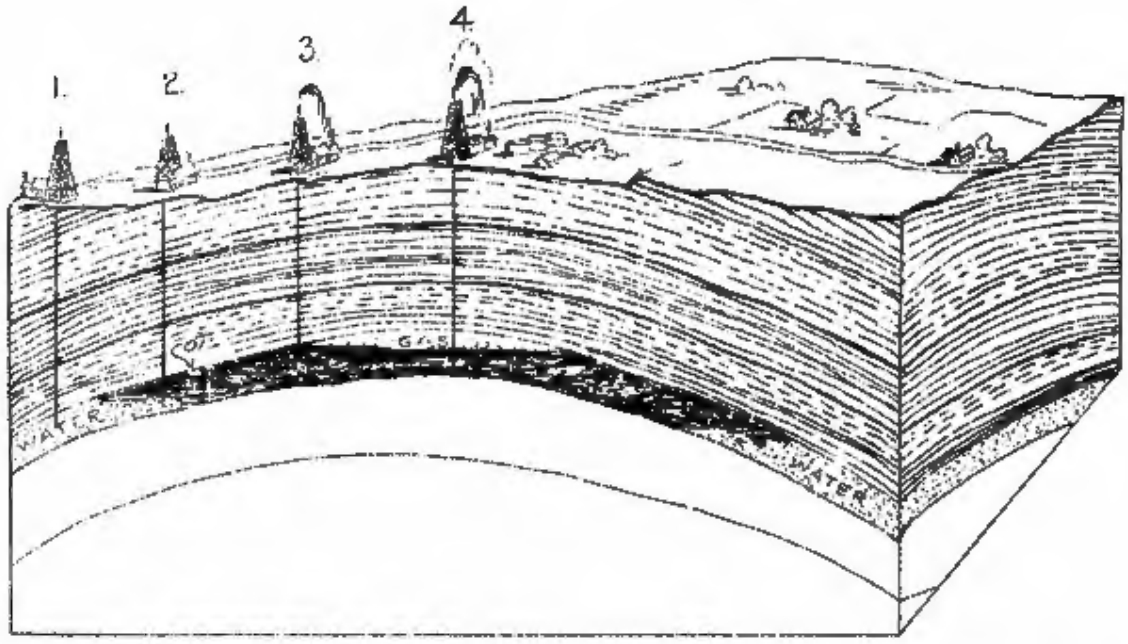

PLATE I. Ideal cross-section of an oil pool, showing how oil and gas arrange themselves in the porous strata with respect to the water.

Well No.1 found only water in the sands. Well No.2 is an edge well, yielding some oil, but when drilled deeper into the sands found water. This well may produce both oil and water together, but if the rock pressures are high, the water may "cone off" the oil flow and result in only a water well. Well No.3 is an oil well, and may be either a pumper or a flowing well depending on sand conditions and pressures. Well No.4 is a gas well, which when drilled deeper into the sand should result in a flowing well, the gas flow bringing the oil out with it.

The Origin of Petroleum

Petroleum takes first rank among the products of decay or distillation of the organic slimes, but may also be formed by the distillation of the coaly deposits from vascular plants.

Nevertheless, the organic matter of algae and spores among plants, and animal tissues, probably form the chief sources of petroleum.

During the geologic periods of great stresses, faulting and folding occur, and possibly the squeeze thus created forces the molecules of oil out of the adjacent shales and limestones into the porous, waterfilled strata. Drop by drop this oil is floated upward along the inclined plane of the porous strata to the structural traps, where the oil is concentrated. Thus it is seen that although the source of the oil is the bituminous mud-rocks, the oil accumulation takes place in the more porous sandstones or limestones (oil sands) which are associated with them, and abounds in pools where anticlinal and domal structures furnish the proper conditions.

Some Recent History of the Keho Lake Well
From the Lethbridge Herald

May 4th 1931 Hudson's Bay Oil and Gas Co. Keho No.1 well, 18 miles north of Lethbridge, drilled into a second and thicker oil sand over the week end and the well may prove to be commercial, although R.Van A.Mills of Calgary, Vice Pres. and Gen.Mgr. of the company was conservative in his statement to the Herald Monday.

Mr Mills said We are getting more oil, the bit having drilled into a six foot sand that caused the oil to rise in the casing 30 to 40 feet. We cannot tell what the well will do until we bail it. We havent bailed it down yet. There is plenty of gas in the well, and the crude is much lighter in grade than first encountered--a light gravity, clean, frothy oil. We are having a sample analyzed but it is over 30 gravity Baume, which is a better crude than first encountered at 3680 ft. We have been getting some oil all the way down from 3680 ft. and the new and thicker sand was entered at 3770 ft. The situation looks highly encouraging."

The farm on which the Hudsons Bay discovery well is located is operated by William Isaacs, well known resident of Nobleford. Very little acreage on the structure is held in Nobleford, but a number of well known Lethbridge business men have held sizable blocks of acreage for some time. Naturally they are watching developments very closely. The Texas Co., Commonwealth, Nordon Corp., Vulcan and other well financed companies hold leases in the Keho field, and it is forecast that extensive drilling is quite certain to follow the present strike.

May 5th 1931 BAILER FAILS TO LOWER OIL. Unofficial estimates place well at 100 barrels a day. Vice Pres.Mills says it is a nice well right now but will go deeper for bigger production. Strike means much for Lethbridge.

That the Keho Lake well east of Nobleford and 18 miles north of Lethbridge is already a commercial proposition seemed assured Tuesday morning. R.Van A. Mills, Vice Pres. of the company announced Tuesday that bailing had proceeded all Monday afternoon, the crew finding it impossible to bail down the column of oil in the well. Mr Mills explained that every bailer brought up yesterday was filled with oil, the flow showing no signs of decreasing, and all efforts to bail it down failed. "This strike means much to Lethbridge", said Mr Mills Tuesday morning. "Its close proximity to the city and the extensive possibilities now opened should spell much in a business way to your city."

Nobleford, May 5th 1931 (Staff reporter for the Lethbridge Herald) Oil is the main topic of conversation in this big little wheat center, and it may develop into a race between the wheat and oil for supremacy, if the new Keho Lake field proves to be as extensive and rich as it now promises. The well looks like a 100 barrel producer at least. Monday afternoon during bailing operations it made 24barrels in one hour of steady bailing .. and the oil was not lowered in the casing. This is flush production, but it is an indication of what the well is capable of doing.

Millions Behind Field Millions of dollars are represented in the Hudsons Bay Oil & Gas Co and the Continental Oil Co of Delaware - a fifty million dollar Co.- which companies control a large acreage in the field.

Location of the Lethbridge-Keho Lake Fold

The same stresses and forces that caused the Rocky Mountains to be lifted, folded and contorted into long North-South ranges, formed the deep synclinal trough paralleling them on the east, known as the Alberta geo-syncline.

Roughly speaking, the Lethbridge-Keho Lake structure is a long, north plunging, irregular fold, trending north and south, about 50 miles east of the Rocky Mountain foothills.

The map below, drawn on the scale of 25 miles to the inch, shows the comparative location of the Lethbridge-Keho Lake Fold with respect to the mountains, the geo-syncline, Turner Valley Oil Field and other geological features of Southern Alberta.

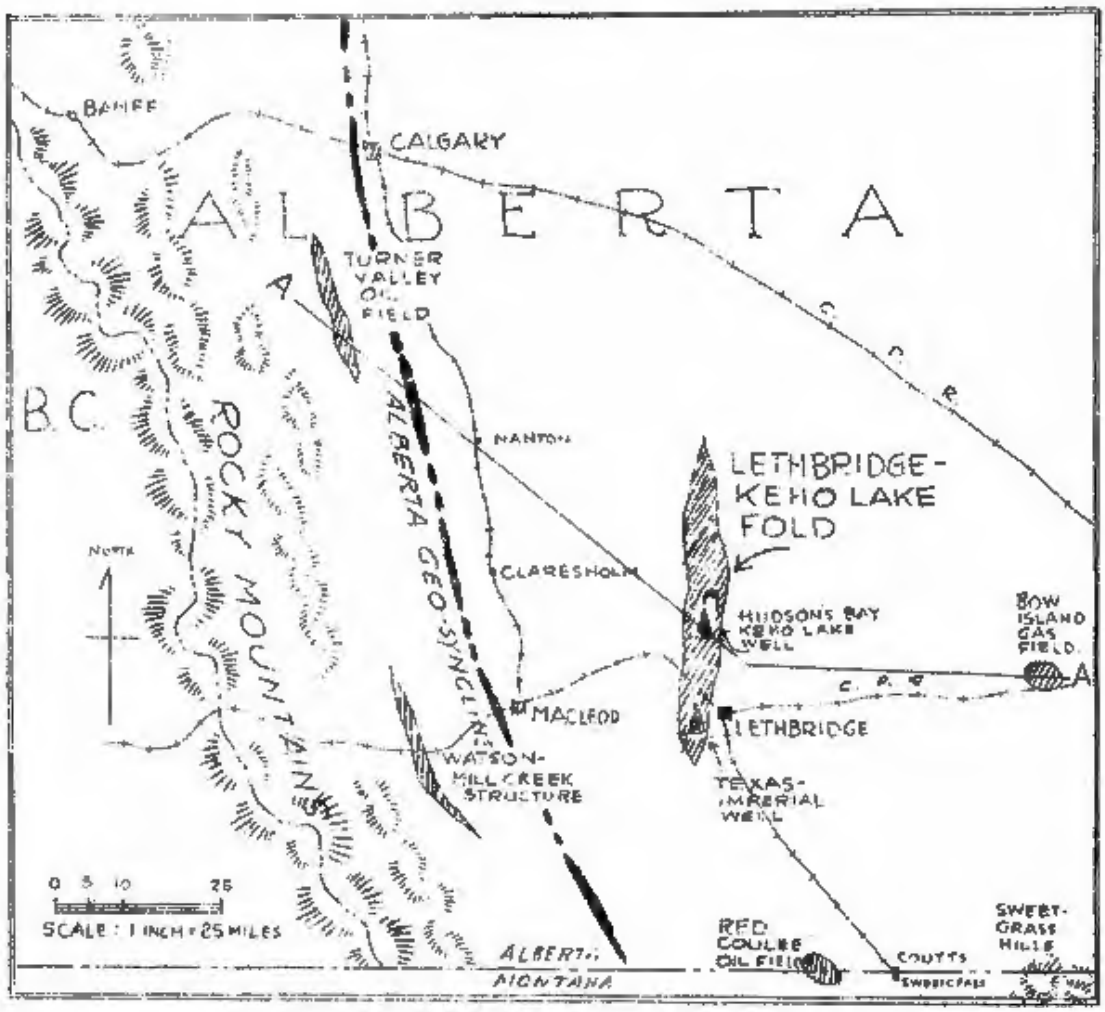

PLATE II. Sketch Map of Southern Alberta, showing location of Hudson's Bay Oil and Gas Co well and the Lethbridge-Keho Lake Fold. This fold is reflected on the surface by a series of prominent ridges, the first noticable change in the topography of the plains east of the foothills.

The cross-section on the next page (Plate 3) shows the long gentle rise in the formations out of the great syncline up to the Keho well. As large contributing drainage areas are necessary for the accumulationsof major pools of oil, it is important to note that the west flank of the Keho fold drains practically all of the oil that would originate in the great syncline, between Keho Lake and the mountains. Thus larger accumulations may be expected in the Keho Lake areas than in the sharp dip folds in the foothills, such as Turner Valley and Mill Creek.

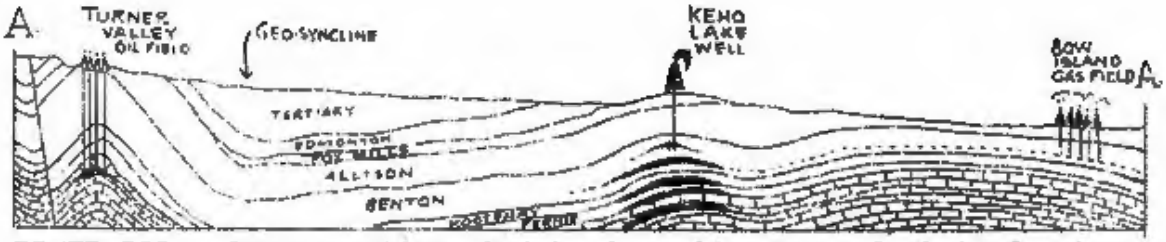

PLATE III. Cross-section sketch along line A-A of Plate 2, showing structural conditions which should cause vast oil accumulations along the Lethbridge-Keho Lake Fold. Compare with Plate 5.

Interesting Similarity of the Lethbridge-Keho Lake Structural Fold to Pecos River Fold.

One of the greatest oil areas ever discovered exists along the Pecos River in West Texas, where several great producing fields have been brought in. In this remarkable area, the Yates pool alone at one time had a potential production of over 3,000,000 bbls. of oil per day. Many of the wells came in with an initial flow of from 50,000 to 125,000 barrels a day from a depth of 953 ft. to 1200 ft. These facts are cited here because the structural conditions in West Texas have such a striking similarity to those in Western Alberta.

Below is a map showing the Pecos River Fold oil fields paralleling the Guadaloupe, Delaware and Davis Mountain ranges, and about the same distance east of the mountains as Keho Lake is east of the Rockies.

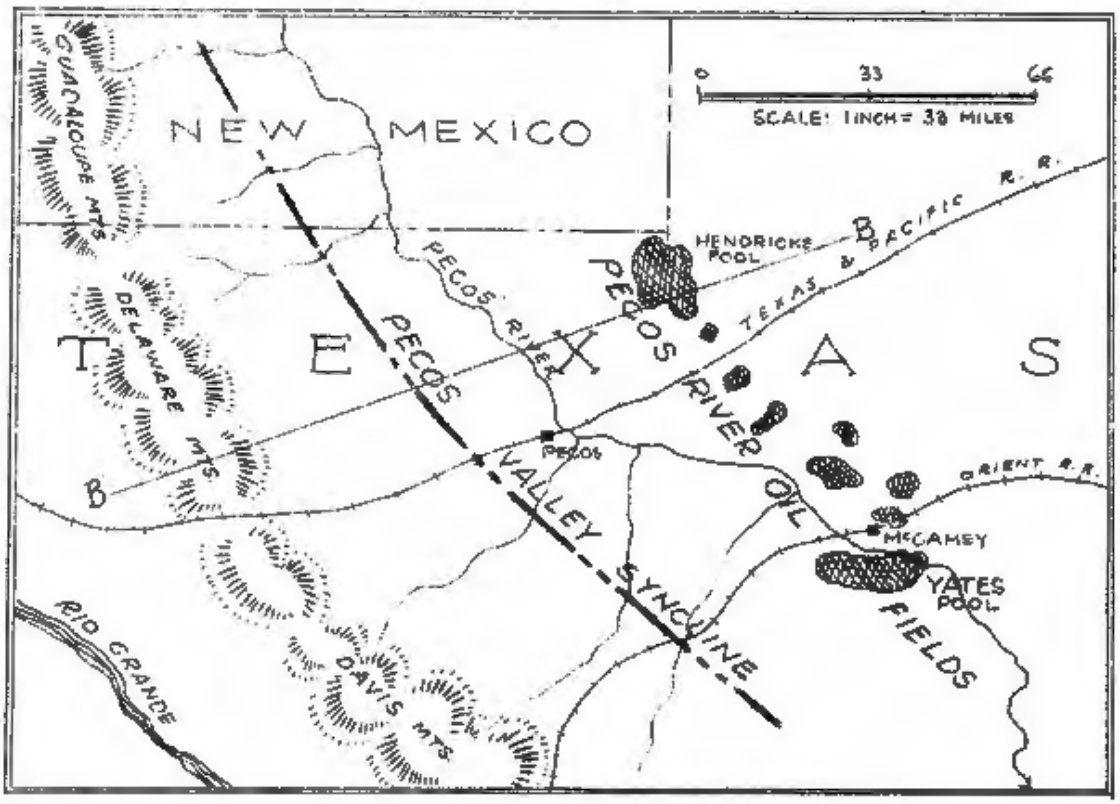

PLATE IV. Map of the West Texas Oil Fields, showing relations of the fields to the Mountains, the syncline etc. Compare with Plate II.

The cross-section below is along line B-B on Plate 4, and shows the geological relations of the Pecos River Fold with respect to the mountain ranges and the deep synclinal trough.

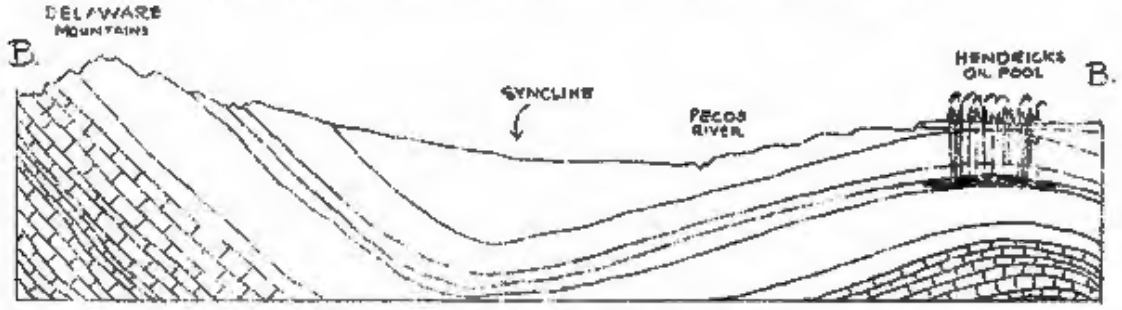

PLATE V. Cross-section sketch along line B-B on Plate 4 showing the geologic structure which caused vast accumulations of oil in the Pecos River fields.

Four Oil Horizons at Keho Lake

At this date the Keho Lake well is drilling at 4040 ft. Below this depth there are four probable producing horizons as follows:

1. The Bow Island gas sand-- a 35 foot porous sandstone which produced large volumes of gas, under a rock pressure of 800 pounds to the square inch, at Bow Island Alta. This sand should be encountered at Keho Lake at 4125 ft. See Plate 3.
2. The Sunburst sand-- a very porous sand at the base of the Kootenay formation. This sand varies greatly in thickness, being from 10 to 60 ft. thick. At Keho it should be tapped at 4450.
3. The Ellis or Vanalta sand-- a compact, hard, limy sand at the base of the Fernie Formation. Usually 10 to 20 ft. thick in the Border fields. To be expected at Keho at 4600 ft.
4. The Madison Limestone-- a rotten porous limestone of Mississippian age which yields oil and gas in Turner Valley and Kevin-Sunburst, Mont. This horizon may be found at Keho at 4900 to 5000 feet.

Conclusions

The discovery of oil in the Benton Formation, approximately 1000 feet higher, geologically, than ever before encountered on the plains of Alberta, is the most significant and important discovery since the Turner Valley strike.

The Lethbridge-Keho Lake structure is now a proven oil bearing field, and the existence of large production from the four lower horizons is predictable.

An extensive oil field or fields in the Lethbridge-Keho Lake fold can be expected because of the vast contributing drainage areas of the Alberta geo-syncline.

Striking similarity of the Lethbridge-Keho Lake structure is shown, compared with the structure of one of the worlds greatest oil producing regions.

Four horizons, productive of oil in other nearby fields of the Province, remain unpenetrated by the drill at Keho Lake.

It is, therefore, only logical to conclude that in the Lethbridge-Keho Lake fold there exists possibilities of bringing in one or more fields of major importance, comparing favorably with the great fields of Oklahoma and Texas.

Respectfully submitted,

Edward Rex Lovewell